Altered Mental Status - Part 2 - Everything Else: The Less Common Causes of AMS

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Definition: Altered mental status has many definitions but fundamentally involves changes in a person's alertness, attention, memory, and/or awareness. Oftentimes, a patient is brought in with the chief complaint of "he/she is not acting at baseline, not acting 'right'." The patient's level of consciousness may be impaired (lethargy, stupor, coma) and/or the patient is not acting appropriately (hyperalert/agitated, impaired cognition, confused/disoriented).

Electrolyte: Sodium - Hyponatremia

- **HISTORY**: History of excessive water ingestion, history of diuretic use, history of congestive heart failure, renal failure, or cirrhosis, history of adrenal insufficiency or glucocorticoid dependency, history of malignancy, history of SIADH; nausea, headache, weakness, lethargy, coma, seizure, respiratory failure
- **EXAM**: Serum sodium often <120mEq/L; dehydration,
- **NEXT STEP**: ABCs, 3% hypertonic saline (although often starting out with normal saline); must monitor acute hyponatremia closely (no more than 10mEq/L in 24 hours) to avoid osmotic demyelination; search for underlying cause (hypovolemic vs euvolemic vs hypervolemic); often fluid-restriction

Electrolyte: Sodium - Hypernatremia

- **HISTORY**: History of large amount of salt ingestion or hypertonic saline administration; history of diabetes insipidus; history of excessive sweating or GI loss (diarrhea, vomiting); nausea, headache, weakness, lethargy, coma, seizure, respiratory failure
- **EXAM**: Serum sodium often >155mEq/L; dehydration (oliguria/anuria),

- **NEXT STEP**: ABCs, 5% dextrose water vs hypotonic saline vs normal saline; must monitor acute hypernatremia closely (no more than 10mEq/L in 24 hours) to avoid cerebral edema; search for underlying cause (hypovolemic vs euvolemic vs hypervolemic); desmopressin for diabetes insipidus

Electrolyte: Bicarbonate - Metabolic acidosis

- **Think *"MUDPILES RT" and "HARD UP"***

Electrolyte: Calcium - Hypercalcemia

- **HISTORY**: History of malignancy, history of hyperparathyroidism; polyuria, weakness, constipation, nausea/vomiting,
- **EXAM**: "Painful bones, kidney stones, abdominal groans, psychiatric moans"; often serum calcium >14mg/dL (3.5mmol/L)
- **NEXT STEP**: ABCs, IV fluid resuscitation with normal saline, dehydration; hematology/oncology consultation for administration of calcitonin and/or bisphosphonates

Electrolyte: Calcium - Hypocalcemia

- **HISTORY**: History of liver or kidney disease, history of hypoparathyroidism or Vitamin D deficiency; generalized weakness, tetany, seizure, coma
- **EXAM**: Often serum calcium <7.5mg/dL (1.9mmol/L); Chvostek sign (facial tetany), Trousseau sign (carpopedal spasm)
- **NEXT STEP**: ABCs, IV calcium gluconate (acute symptomatic hypocalcemia); evaluate and treat for concurrent hypomagnesemia

Endocrine: TSH - Myxedema coma

- **HISTORY: History of hypothyroidism or autoimmune thyroiditis (Hashimoto's)**
- **EXAM: Abnormal thyroid exam (scar, goiter); metabolic pathways are slowed down - hypothermia, hypotension, hypoglycemia, hypoventilation; nonpitting edema in soft tissues; seizures, lethargy, coma**
- **Dx is WITH TSH!**
- **NEXT STEP: ABCs, endocrine consultation; T4 and T3 administration; evaluate for concurrent adrenal insufficiency (serum cortisol) as well as often empiric administration of hydrocortisone IV; evaluate for triggers (infection, ischemia, point of care pregnancy test, drugs)**

Rx: Empiric therapy (slowly and cautiously) with IV thyroxine is indicated with suggestive clinical picture when there will be any significant delay in lab confirmation. Supportive measures are extremely important: mechanical ventilation, appropriate fluid replacement, correction of hyponatremia and hypothermia. Rx underlying infection

Myxedema coma is an endocrine emergency and should be treated aggressively. The mortality rate is high at 30 to 40 % !

Endocrine: TSH - Thyroid storm

- **HISTORY**: History of hyperthyroidism (Graves' disease, toxic multinodular goiter); vomiting, diarrhea
- **EXAM**: Abnormal thyroid exam (goiter, nodular); ophthalmopathy (proptosis); exaggeration of hyperthyroid symptoms: tachycardia, hyperthermia, anxiety, delirium, lethargy, coma; may lead to congestive heart failure with hypotension and arrhythmia
- **NEXT STEP**: ABCs, endocrine consultation; PPIS (propranolol, propylthiouracil or methimazole, iodine solution, steroids/hydrocortisone); evaluate for triggers (infection, trauma, iodine load)

Rx: Empiric therapy (slowly and cautiously) with **IV propranolol** with suggestive clinical picture and a significant delay in lab confirmation. Also treat with **methimazole** (PTU in pregnancy), **steroids** and **SSKI**.

Electrolyte: BUN - Uremic encephalopathy

- **HISTORY**: History of renal insufficiency or end stage renal disease, Missed dialysis, increase in BUN/Creatinine, asterixis
- **EXAM**: AV fistula, dialysis catheter, oliguria/anuria; neurologic deficit, asterixis
- **NEXT STEP**: ABCs, EKG (hyperkalemia and dysrhythmia), serum electrolytes, emergent renal consultation for hemodialysis

Rx: Dialysis. May need prolonged or repeated dialysis – special attention to protocol required (by renal consult!)

Encephalopathy: Ammonia - Hepatic encephalopathy

- **HISTORY**: History of cirrhosis or end-stage liver disease, most often precipitated by GI bleeding (often occult) and spontaneous bacterial peritonitis (SBP), asterixi

- **EXAM**: Stigmata of cirrhosis; asterixis; evaluate for increased intracranial pressure, as hepatic encephalopathy is associated with cerebral edema
- **Dx:** Serum ammonia level
- **NEXT STEP**: ABCs, CT head noncontrast; consider hepatic failure and infectious trigger; lactulose is controversial in acute hepatic encephalopathy; liver consultation (liver transplantation)

Rx: Lactulose (PO, NG or rectal) or **neomycin** (PO, NG). Empric therapy may proceed in suggestive cases before lab confirmation. Improvement with therapy may obviate need for further W/U if pt. improves.

Encephalopathy: Wernicke's

- **HISTORY:** History of alcohol abuse/dependence or malnutrition; history of malignancy or long-term parenteral nutrition-dependency
- **EXAM:** Classic triad = "confusion, ataxia, ophthalmoplegia"; nystagmus, cranial nerve palsy
- **NEXT STEP:** ABCs; thiamine administration; address nutrition status and replete as needed

Toxicology (Salicylate, Anticholinergics)

- **HISTORY**: SALICYLATE: history of chronic pain, elderly; tinnitus, nausea/vomiting, shortness of breath; ANTICHOLINERGICS: "red as a beet" (cutaneous vasodilation), "dry as a bone" (anhidrosis), "hot as a hare" (hyperthermia), "blind as a bat" (miosis), "mad as a hatter" (delirium, hallucinations), "full as a flask" (urinary retention) Extremely common and often overlooked cause of AMS in the elderly. It can be caused by a dazzling array of medications, as many have a slight activity at cholinergic receptors.
  - **Dx:** A good drug history (incl. OTC + herbal).
- **EXAM**:
  - SALICYLATE: hyperpnea, hearing abnormalities, tachycardia, dehydration;
  - ANTICHOLINERGIC: toxidrome as mentioned
- **NEXT STEP**: ABCs, EKG, fluid resuscitation poison control or toxicology consultation; SALICYLATE (activated charcoal may be indicated, sodium bicarbonate to alkalinize, hemodialysis) chronic ASA toxicity **Rx**: Emergent **dialysis**.

Usually multiple or extended runs of dialysis are required.;
ANTICHOLINERGIC (supportive care); evaluate for 5150 and underlying psychiatric disease.

Anticholinergic Rx: Consider **physostigmine** if clear-cut toxidrome and suggestive history.

Many clinicians are hesitant to give – may be dangerous in TCA toxicity. However, resolution of symptoms obviates need for extensive AMS W/U.

Toxicology: Drug-Drug Interaction (Serotonin Syndrome, Neuroleptic Malignant Syndrome)

- **HISTORY**: History of psychiatric conditions taking psychiatric medications; SS: onset of symptoms is within 24 hours; NMS: onset of symptoms is days to weeks
- **EXAM**:

Serotonin Syndrom: Hyperthermia, agitation, clonus (ocular, muscle), tremor, hyperreflexia, flushed skin and diaphoresis.

- **Dx:** Fever and rigidity usually present.
- **Rx:** Aggressive cooling measures if febrile. **Cyproheptadine**.
- ICU management of all systems.

Neuroleptic Malignant Syndrome: Extreme muscular rigidity, hyperthermia, autonomic instability (tachycardia, hypertension, diaphoresis)

- **Dx:** Fever and rigidity usually present. Elevated LFTs.
- **Rx:** Aggressive cooling measures. Benzodiazepines, **Dantrolene** or **bromocryptine**. Measure CK. ICU management of all systems.

- **NEXT STEP**: ABCs, supportive care, stop suspected offending agents, poison control/toxicology consultation. SS: cyproheptadine, benzodiazepine for agitation; NMS: intubation, dantrolene and/or bromocriptine.